

# STUDY TO ASSESS THE PERIPHERAL ARTERY DISEASE AMONG TYPE 2 DIABETES MELLITUS ATTENDING AT YENEPOYA MEDICAL COLLEGE HOSPITAL

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## Abstract

**Background:** Diabetes Mellitus (DM) has become a major global health challenge, with Peripheral Arterial Disease (PAD) being a significant macrovascular complication. PAD is characterized by the occlusion of peripheral arteries and is a marker for atherothrombotic disease. The prevalence of PAD among diabetic patients is concerning due to its association with increased risk of amputation and mortality. This study aimed to assess the prevalence of PAD in type 2 diabetes mellitus patients and examine the correlation between the Ankle Brachial Index (ABI) and the duration of diabetes. **Materials and Methods:** A cross-sectional study was conducted at Yenepoya Medical College from December 26, 2018, to December 26, 2019, involving 162 type 2 DM patients. Participants were selected based on specific inclusion criteria, and written informed consent was obtained. Excluded were smokers, individuals with lower limb filariasis, or deep vein thrombosis. ABI was measured using a handheld Doppler in a supine position after 10 minutes of rest. Statistical analysis was performed using SPSS v23.0. **Results:** The study population had an average age of 56.35 years, with 63.6% males and 36.4% females. PAD was present in 20.4% (33 out of 162) of participants. A significant negative correlation was found between ABI and the duration of diabetes ( $R = -0.59$ ,  $p = 0.00$ ). Most patients were on oral hypoglycemic agents (79.6%), with only 21.6% achieving controlled blood sugar levels. Hypertension was present in 58% of the participants. Albuminuria and retinopathy were found in 26.5% and 29% of patients, respectively. **Conclusion:** The prevalence of PAD among type 2 DM patients was 20.4%, with a significant correlation between ABI and diabetes duration. Early detection and management of PAD are crucial in improving outcomes for diabetic patients.

**Keywords:** Type 2 diabetes mellitus, Peripheral Arterial Disease, Ankle Brachial Index, macrovascular complications, diabetes duration

## Introduction

In today's world, Diabetes Mellitus (DM) has emerged as a widespread epidemic and a significant health challenge, particularly due to its complications.<sup>1</sup> One such complication is

Peripheral Vascular Disease (PVD), a macrovascular condition that includes Peripheral Arterial Disease (PAD).<sup>2</sup> PAD is characterized by the occlusion of peripheral arterial vessels and serves as an indicator of atherothrombotic disease. Type 2 diabetes mellitus is diagnosed when fasting plasma glucose exceeds 7.0 mmol/L (126 mg/dL), two-hour plasma glucose exceeds 11.1 mmol/L (200 mg/dL), or when random blood glucose concentration exceeds 11.1 mmol/L (200 mg/dL) along with classic hyperglycemia symptoms, or an HbA1c level greater than 6.5%.<sup>3</sup>

PAD is particularly prevalent among patients with diabetes, manifesting clinically as intermittent claudication. Diabetic patients are twenty times more likely to develop PAD in the lower extremities, significantly increasing the risk of lower extremity amputation and mortality compared to non-diabetics.<sup>4</sup> The American Diabetes Association estimates that 40-50% of diabetes-related amputations are preventable through early detection of PAD, which affects between 10-42% of diabetic patients.<sup>5</sup>

Risk factors for PAD in diabetic patients include advanced age, long duration of diabetes, smoking, hypertension, hyperlipidemia, and increased waist-to-hip ratio. Additionally, elevated levels of C-reactive protein (CRP), fibrinogen, apolipoprotein B, homocysteine, lipoprotein(a), and plasma viscosity are associated with PAD. Interestingly, there is an inverse relationship between PAD and alcohol consumption.<sup>6</sup> The Ankle Brachial Index (ABI) is an effective diagnostic tool for PAD, with a sensitivity of 90% and specificity of 98% for detecting significant arterial stenosis. An ABI of less than 0.9 indicates PAD.<sup>7</sup> However, detecting PAD in diabetic patients can be complicated by peripheral neuropathy, as ischemic symptoms are often not felt due to reduced sensation, leading patients to present with ulcers or gangrene.<sup>8</sup> Present study aimed to assess the occurrence of peripheral artery disease and correlate the ankle brachial index with duration of type 2 diabetes mellitus.

## Material and Method

A cross-sectional study was conducted on 162 participants admitted to Yenepoya Medical College from December 26, 2018, to December 26, 2019. The participants, all diagnosed with type 2 diabetes mellitus according to WHO criteria, provided consent for the study. Inclusion criteria included a fasting plasma glucose level greater than 7.0 mmol/L (126 mg/dL), two-hour postprandial plasma glucose greater than 11.1 mmol/L (200 mg/dL), random blood glucose concentration greater than 11.1 mmol/L (200 mg/dL) with classical symptoms of hyperglycemia, or an HbA1c level above 6.5%. Exclusion criteria were smokers, individuals with lower limb filariasis, and those with deep vein thrombosis.

The study methodology included obtaining ethical committee clearance by December 26, 2018, followed by data collection starting January 2019. Patients were selected based on inclusion criteria, and written informed consent was obtained after explaining the study design. Relevant investigations were conducted as per protocol, with data collected and statistically analyzed, leading to result interpretation and final dissertation submission. The Ankle Brachial Index (ABI) was calculated using a handheld Doppler. Measurements were taken in a supine position after 10 minutes of rest, using a pneumatic cuff and Doppler ultrasound probe to determine systolic blood pressure in the lower and upper limbs. The ABI was calculated using the formula  $ABI = P_{Leg} / P_{Arm}$ , where  $P_{Leg}$  is the systolic blood pressure of dorsalis pedis or posterior tibial arteries, and  $P_{Arm}$  is the brachial systolic blood pressure. An ABI of less than 0.9 was indicative of peripheral arterial disease.

Statistical analysis: data were entered in excel sheet and analysed using SPSS v23.0.

## Result

A cross-sectional study conducted over one year at Yenepoya Medical College evaluated 162 type 2 diabetes mellitus (DM) patients. The participants' ages ranged from 36 to 92 years, with an average age of 56.35 years, comprising 63.6% males and 36.4% females.

**Table 1: Showing demographic details of the patients**

		No. of patients	Percentage (%)
Age	20-40	17	10.5
	40-60	84	51.9
	>60	61	37.7
Gender	Male	103	63.6%
	Female	59	36.4%
Treatment	OHA	129	79.6%
	Insulin	24	14.8%
	OHA+insulin	7	4.3%
	Non	2	1.2%
Compliance to treatment	Regular medication	115	71%
	Irregular medication	47	29%
Diabetic control	Controlled	35	21.6%
	Uncontrolled	127	78.4%
Hypertension	Hypertensive	94	58%
	Normal	68	42%
BMI	<18	12	7.4
	18-22.9	46	28.8
	23-24.9	24	14.8
	25-29.9	66	40.7
	>30	14	8.6

**Table 2: Complications of the diabetes mellitus**

		No. of patients	Percentage (%)
Albuminuria	Present	43	26.5
	Absent	119	73.5
Retinopathy	Present	47	29%
	Absent	115	71%
Gender distribution in PAD patients	Male	26	79%
	Female	7	21%
Diabetic control among PAD	Controlled	4	12%
	Uncontrolled	29	88%
Symptomatic patients with PAD	Symptomatic	13	39%
	Asymptomatic	20	61%

Among these, 20.4% (33 participants) were diagnosed with Peripheral Arterial Disease (PAD). Pearson's correlation analysis revealed a significant negative correlation between the Ankle Brachial Index (ABI) and the duration of diabetes ( $R = -0.59$ ,  $p = 0.00$ ). Of the participants, 79.6% were on oral hypoglycemic agents (OHA), 14.8% on insulin, 4.3% on both, and 1.2% were not on any medication. Medication compliance was reported in 71% of cases. Blood sugar control was poor, with only 21.6% achieving HbA1c levels below 7%, and 78.4% having uncontrolled diabetes. Hypertension was present in 58% of the

participants, and 42% were normotensive. The majority had a BMI between 25-29.9 kg/m<sup>2</sup>. Albuminuria was observed in 26.5% of the participants, and 29% had diabetic retinopathy.

### Discussion

A cross-sectional study was carried out on 162 type 2 diabetes mellitus patients at Yenepoya Medical College Hospital, with ages ranging from 36 to 92 years. The study population comprised 63.3% males and 36.7% females, with a mean age of 56.35 years. Peripheral arterial disease (PAD) was observed in 20.4% of the participants, with 33 individuals diagnosed with PAD. A significant correlation was found between the duration of diabetes and Ankle Brachial Index (ABI) ( $p < 0.01$ ). Among the participants, 58% had hypertension, and the mean BMI was 24.57, with most individuals having a BMI between 25-29.9 kg/m<sup>2</sup>. Only 39% of those with PAD showed symptoms. The prevalence of albuminuria and diabetic retinopathy was 26.5% and 29%, respectively. Comparatively, similar studies reported varied PAD prevalence rates in diabetic populations: Premalatha G. *et al.* found 7.8%, Ramachandran A. *et al.*<sup>9</sup> found 4%, Kamal KK *et al.*,<sup>10</sup> found 12.9%, and Vaibhav Shukla *et al.*,<sup>11</sup> found 36%. Other studies indicated a prevalence of PAD ranging from 13.6% to higher levels in diabetic populations compared to normal populations.

Banait Vs *et al.*,<sup>12</sup> conducted a study among 112 diabetic patients with an aim to determine the prevalence of abnormal ABI as indicator of PVD in type-2 diabetes and to correlate the prevalence of cardiovascular risk factors and vascular complication of type-2 diabetes with abnormal ABI. He concluded that duration of diabetes is also correlated with ABI. Raman PG *et al.*,<sup>13</sup> conducted a study with aim to assess ABI as a screening method to target subclinical atherosclerosis. The study showed >50% participants with ABI <0.9 were asymptomatic, the prevalence of PAD in his study was 18%. Similar study was conducted by Vaibhav Shukla *et al.*,<sup>11</sup> among 200 Type 2 Diabetes Mellitus Patients in a Teaching Hospital in Uttar Pradesh. In that study it was concluded that the prevalence of PAD in Type 2 diabetics was 36% and there was a significant association between PAD and duration of diabetes, waist circumference, hypertension and micro vascular complications. Karma Loday Bhutia *et al.*,<sup>14</sup> conducted study among 1000 diabetes patient and prevalence of diabetic retinopathy was 17.4%. In the study conducted by Varghese A *et al.*,<sup>15</sup> amongst the 425 diabetic patients in south india, the prevalence of albuminuria was 36.3%. MCAlpine *et al.*,<sup>16</sup> conducted a study among 6632 diabetic population and prevalence of PAD among them was 13.6%. Elham Faghihimani *et al.*,<sup>17</sup> conducted a study which concluded that the prevalence of PAD was higher in diabetic population than the normal population (8.5% vs 0.0%,  $p < 0.05$ )

### Conclusion

The study highlights the significant prevalence of peripheral arterial disease (PAD) among type 2 diabetes mellitus patients, with 20.4% of individuals affected. It underscores the critical need for early screening and intervention for PAD in diabetic patients, especially as the duration of diabetes is strongly correlated with decreased ABI values. Regular monitoring of ABI and awareness of PAD's impact are essential in managing long-term diabetes complications, as early detection can potentially improve patient outcomes and prevent further vascular issues.

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